INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

N99/410/H(1)

BIOLOGY

Higher Level

Wednesday 10 November 1999 (afternoon)

Paper 1 — 1 hour

This examination paper consists of 40 questions.

Each question offers 4 suggested answers.

The maximum mark for this paper is 40.

INSTRUCTIONS TO CANDIDATES

Do NOT open this examination paper until instructed to do so.

Answer ALL questions.

For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

Calculators are NOT permitted for this examination paper.

EXAMINATION MATERIALS

Required:
Optically Mark Read (OMR) answer sheet

Allowed:
A simple translating dictionary for candidates not working in their own language

1. Which structure is the smallest?

   A. A cell

   B. A virus

   C. A mitochondrion

   D. A bacterium

2. The cells of plant roots can take up ions from the soil against the concentration gradient. What is the process used?

   A. Osmosis

   B. Passive transport

   C. Diffusion

   D. Carrier-assisted transport

3. Why does water provide a relatively stable external environment for aquatic organisms?

   A. It has a high surface tension.

   B. It is transparent so light can pass through it.

   C. Its boiling point is 100 °C.

   D. Its temperature varies much less than air temperature.

4. What is the name of the type of reaction that involves the production of water when two molecules link together?

   A. Hydrolysis

   B. Photolysis

   C. Condensation

   D. Respiration

5. What are enzymes in plant cells made from?

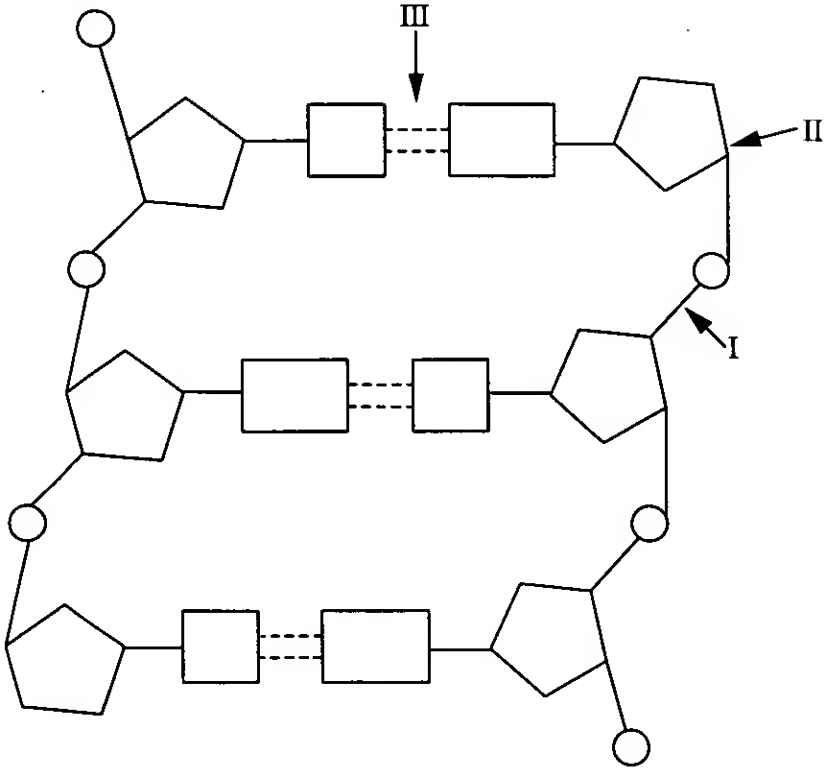
A. Starch

B. Cellulose

C. Lipid

D. Protein

The diagram shows a small section of DNA. It refers to question 6.



6. What do the labels I, II, and III represent?

	I	II	III
A.	Covalent bond	Deoxyribose	Hydrogen bond
B.	Hydrogen bond	Deoxyribose	Covalent bond
C.	Covalent bond	Phosphate	Hydrogen bond

Refer to the following table of mRNA codons and their corresponding amino acids to answer question 7.

First Base	Second base: U		Second base: C		Second base: A		Second base: G		Third Base
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC	Phe	UCC	Ser	UAC	Tyr	UGC	Cys	C
	UUA	Leu	UCA	Ser	UAA	Stop	UGA	Stop	A
	UUG	Leu	UCG	Ser	UAG	Stop	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC	Leu	CCC	Pro	CAC	His	CGC	Arg	C
	CUA	Leu	CCA	Pro	CAA	Gln	CGA	Arg	A
	CUG	Leu	CCG	Pro	CAG	Gln	CGG	Arg	G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC	Ile	ACC	Thr	AAC	Asn	AGC	Ser	C
	AUA	Ile	ACA	Thr	AAA	Lys	AGA	Arg	A
	AUG	Met*	ACG	Thr	AAG	Lys	AGG	Arg	G
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
	GUC	Val	GCC	Ala	GAC	Asp	GGC	Gly	C
	GUA	Val	GCA	Ala	GAA	Glu	GGA	Gly	A
	GUG	Val	GCG	Ala	GAG	Glu	GGG	Gly	G

* or start codon

7. Which DNA sequence could code for a stop signal?

A. AUG

B. AUU

C. ACT

D. CGA

8. Which cross is an example of a test cross?

A. AA or Aa × Aa

B. X^RX^R or $X^RX^r \times X^RY$

C. $Hb^AHb^S \times Hb^AHb^S$

D. BB or Bb × bb

9. Which characteristics are shown by the gene controlling ABO blood groups?

I Sex linkage

II Codominance

III Multiple alleles

A. I and II only

B. II and III only

C. I and III only

D. I, II, and III

10. A woman is heterozygous for a recessive X-linked allele that causes haemophilia. Which statement is correct?

A. She is a carrier of haemophilia.

B. All of the gametes she produces will have the allele that causes haemophilia.

C. None of the gametes she produces will have the allele that causes haemophilia.

D. She is codominant for haemophilia alleles.

11. What is the source of the oxygen produced by plants during photosynthesis?

A. Carbon dioxide

B. Water

C. Carbohydrate

D. Enzymes

12. What process in saprotrophs results in the release of carbon dioxide to the atmosphere?

A. Photosynthesis

B. Respiration

C. Combustion

D. Digestion

13. What factor(s) can affect the size of a population?

I Mortality

II Emigration

III Carrying Capacity

A. I only

B. III only

C. I and II only

D. I, II, and III

The following data were collected in an experiment to examine the difference in body length between two populations of lizards. They refer to question 14.

Body lengths (cm) of two populations of lizard (*Varanus*)

Population A	Population B
21	26
22	28
24	29
24	31
25	32
26	34
27	35
28	37
29	37
31	41
$\bar{x} = 25.7$	$\bar{x} = 33$
$s = 3.1$	$s = 4.7$

14. Which statement is correct?

A. The median values for the two sets of data are 24 for A and 37 for B.

B. The median values for the two sets of data are 25.7 for A and 33 for B.

C. 68% of the values in sample A are within 3.1 cm of the mean.

D. The variability in body length is greater in Population A than Population B.

15. What is the sequence of structures through which a molecule of oxygen will pass from its point of entry into the body?

A. Pulmonary artery → alveolus → left ventricle → aorta

B. Pulmonary artery → left atrium → left ventricle → aorta

C. Alveolus → pulmonary artery → left atrium → right atrium

D. Alveolus → pulmonary vein → left ventricle → aorta

16. What acts as a barrier to infection by microbes?

A. Antibodies

B. Antigens

C. Blood vessel walls

D. Mucous membranes

17. Which change occurs with the onset of exercise?

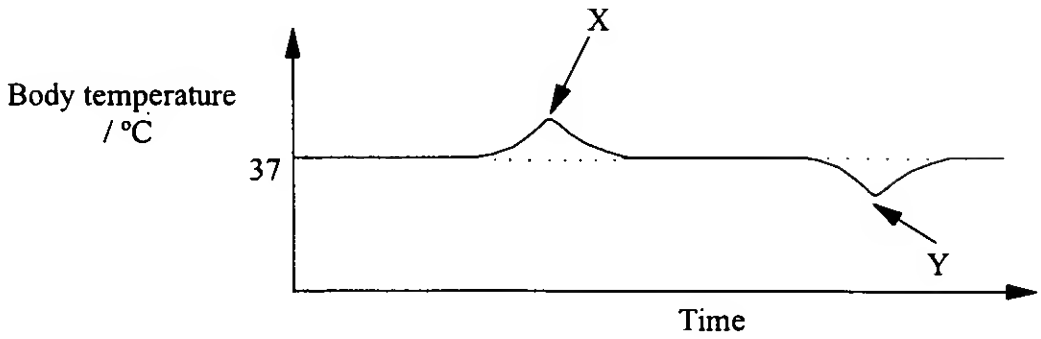
A. Decreased stimulation of the breathing centre in the brain

B. Decrease in pH of the blood

C. Decrease in rate of contraction of the diaphragm

D. Decrease in carbon dioxide concentration of the blood

18.



The graph shows small fluctuations in human body temperature over a period of a few hours. What type of feedback control could cause the changes at the points marked X and Y?

	X	Y
A	Negative feedback	Positive feedback
B	Positive feedback	Negative feedback
C	Negative feedback	Negative feedback
D	Positive feedback	Positive feedback

19. What is amniocentesis?

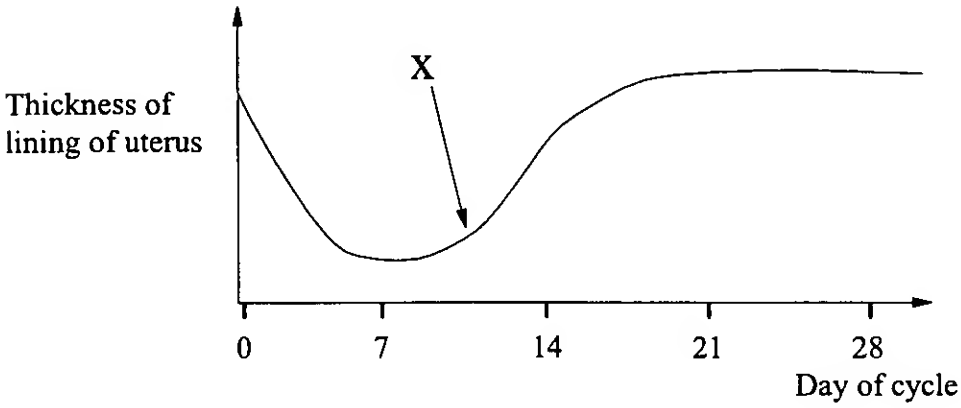
A. The breakdown of the amnion at the start of menstruation

B. A technique for *in vitro* fertilisation

C. Removal of a sample of amniotic fluid from the uterus

D. A method of contraception

20. The diagram shows the change in the lining of the uterus during the menstrual cycle. Which hormone is being secreted by the ovary at X?



A. Progesterone

B. Oestrogen

C. FSH

D. LH

21. In which stages of mitosis do the following events take place?

	chromosomes move to poles of the cell	*nuclear membrane breaks down*	*chromosomes uncoil and lengthen*
A.	Prophase	Metaphase	Anaphase
B.	Metaphase	Telophase	Prophase
C.	Telophase	Anaphase	Metaphase
D.	Anaphase	Prophase	Telophase

22. The palisade mesophyll in the leaf consists of a layer of similar cells containing chlorophyll for photosynthesis. What type of structure is it?

A. Tissue

B. Organ

C. Organ system

D. Organism

23. What is an intron?

A. A strand of DNA that codes for a polypeptide

B. The triplet of bases on tRNA that bonds to an amino acid

C. A sequence of three bases on mRNA that codes for an amino acid

D. DNA transcribed to mRNA but not translated into a polypeptide

24. How do polysomes increase the efficiency of mRNA translation compared with translation by free ribosomes?

A. They allow different types of polypeptide to be made at the same time.

B. They allow more mRNA molecules to be transcribed.

C. Many copies of the polypeptide strand can be produced at one time.

D. Each ribosome can transcribe the mRNA quicker.

25. Which type of bonding is responsible for forming the secondary structure of proteins in hair and wool?

A. Disulfide bridges

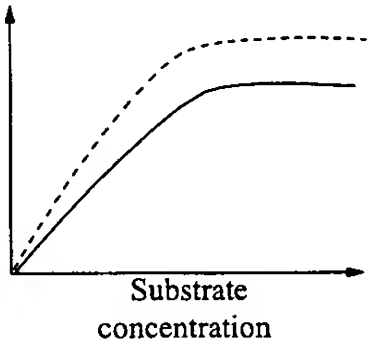
B. Hydrogen bonds

C. Ionic bonds

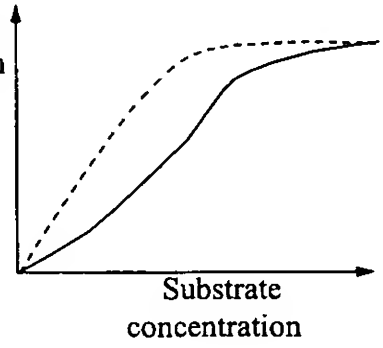
D. Peptide linkages

26. The dotted line on each graph shows how the rate of reaction of the enzyme cytochrome oxidase varies with the substrate concentration. Which solid line shows the effect on the rate of reaction of adding CN^-, a non-competitive enzyme inhibitor?

A.



B.



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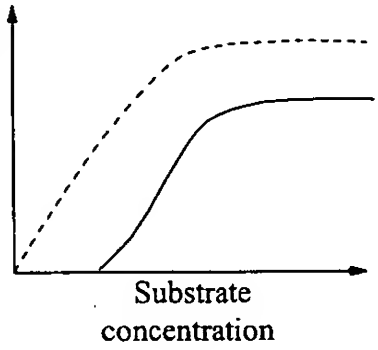
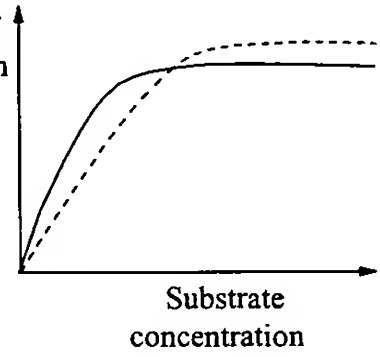


D.



27. During photosynthesis, which products of the light-dependent reaction are used in the light independent reaction?

A. ATP and oxygen

B. Glucose and amino acids

C. RUBP and glycerate-3-phosphate

D. $NADPH + H^+$ and ATP

28. Pineapple plants keep their stomata closed during the day to conserve water. At night the stomata are opened so that the plant can fix carbon dioxide. What type of plant is the pineapple?

A. CAM

B. C_3

C. C_4

D. PEP

29. In tomato plants, the gene for tall plants (T) is dominant to the gene for short plants (t), and the gene for hairy stems (H) is dominant to the gene for smooth stems (h). The two genes are unlinked. If a tall smooth plant (Tthh) is crossed with a short hairy plant (ttHh), what would be the genotypes of offspring which are recombinants?

A. TtHh and tthh

B. Tthh and ttHH

C. Tthh and ttHh

D. TTHH and TTHh

30. Which pieces of information are needed to construct a gene map?

A. The phenotypes of individuals in pedigree charts

B. The genotype ratio of a monhybrid cross

C. An analysis of chromosome banding using a microscope

D. The cross over value (COV) of linked genes

31. What can result from many genes each having a small effect on a characteristic?

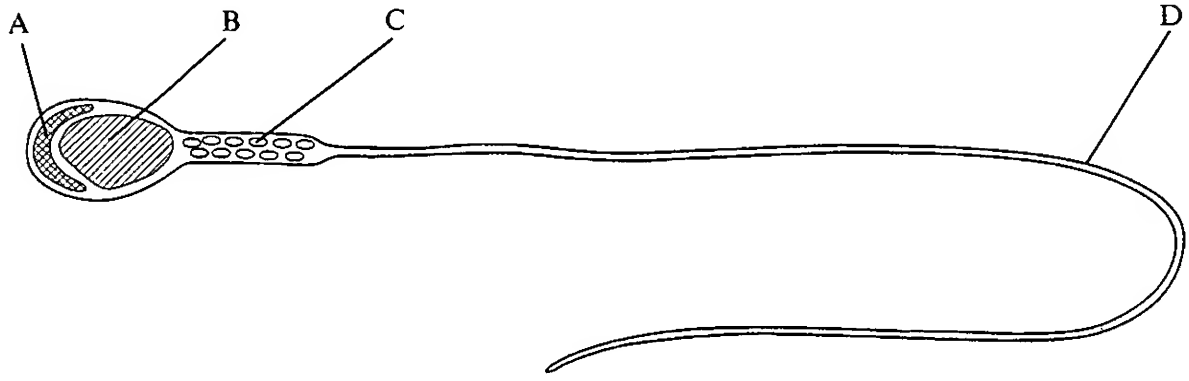
A. Non disjunction

B. Continuous variation

C. Discontinuous variation

D. Codominance

32. Which part of the sperm cell is responsible for the acrosome reaction during fertilisation?



33. What is the genetic material of HIV and what cells does it infect?

	Genetic material	*Cells it infects*
A.	RNA	helper T-cells
B.	DNA	helper T-cells
C.	RNA	B-lymphocytes
D.	DNA	B-lymphocytes

34. The Canadian pondweed is known as *Elodea canadensis* according to the binomial system of nomenclature. To which genus does the plant belong?

A. Canadian pondweed

B. *Elodea canadensis*

C. *Elodea*

D. *canadensis*

35. What describes the nutrition of fungi?

A. Autotrophic, by producing organic matter from inorganic raw materials

B. Heterotrophic, by obtaining organic matter from other organisms

C. Autotrophic, by obtaining organic matter from other organisms

D. Heterotrophic, by producing organic matter from inorganic raw materials

36. What causes the depolarisation of the membrane when an action potential passes along the axon of a neurone?

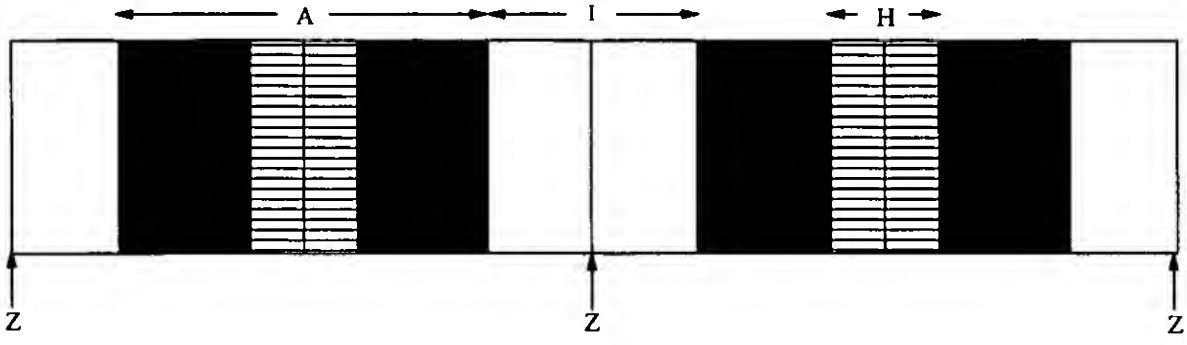
A. Potassium ions entering the axon

B. Potassium ions leaving the axon

C. Sodium ions entering the axon

D. Sodium ions leaving the axon

37. The diagram shows the dark and light bands of part of a relaxed myofibril of skeletal muscle as seen in a electron micrograph.



Key: actin only; myosin only; myosin overlapping with actin.

What changes take place in the length of the A, I, and H bands when the muscle contracts?

	A band	*I band*	*H band*
A.	same	same	longer
B.	same	shorter	shorter
C.	shorter	shorter	shorter
D.	longer	same	same

38. Freshwater fish live in a habitat where water is readily available. Which nitrogenous waste product do they excrete?

A. Uric acid

B. Urea

C. Ammonia

D. Trimethylamine oxide

39. Where in the mammalian kidney does **most** reabsorption of water take place?

A. Proximal convoluted tubule

B. Loop of Henle

C. Distal convoluted tubule

D. Collecting duct

40. Which weather conditions would cause the highest rate of transpiration from a terrestrial mesophytic plant?

A. Cool, humid, and still air

B. Hot, dry, and windy

C. Hot, humid, and windy

D. Hot, dry, and still air